

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,977,235 B2
APPLICATION NO. : 10/829550
DATED : December 20, 2005
INVENTOR(S) : Max P. McDaniel et al.

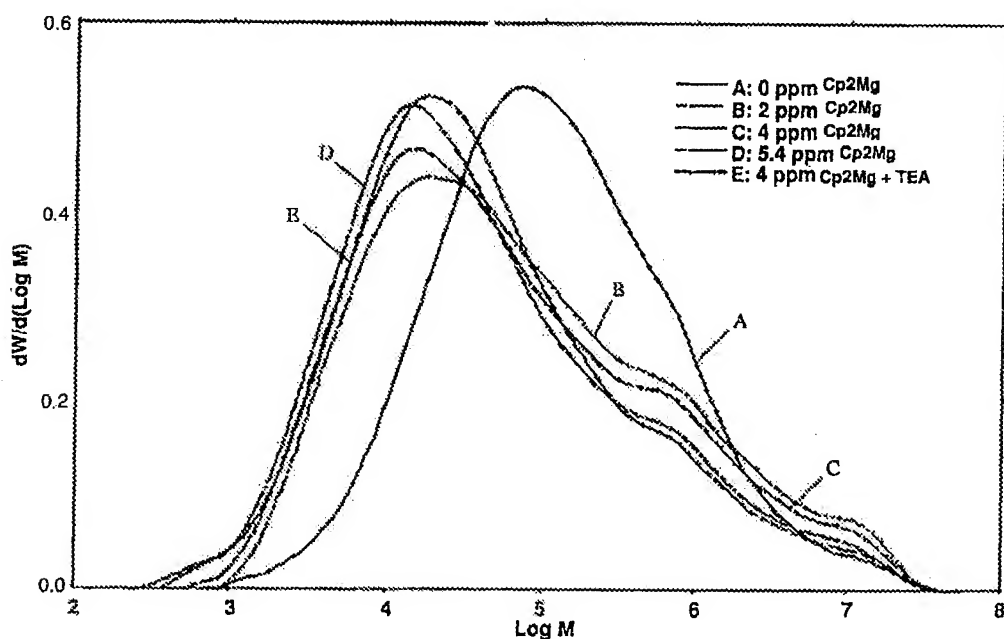
Page 1 of 2

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

The title page, showing an illustrative figure, should be deleted and substitute therefor the attached title page.

Drawings - Sheet 2 of 3

Replace Figure 2 with the following figure:



In Column 1, line 55, replace “(i.e., M_w/m_N)” with -- (i.e., M_w/M_N) --

In Column 7, line 57, replace “the Theological breadth” with -- the rheological breadth --

In Column 8, line 21, replace “have Theological breadth” with -- have rheological breadth --

Signed and Sealed this
Twenty-second Day of March, 2011

David J. Kappos

David J. Kappos
Director of the United States Patent and Trademark Office

(12) **United States Patent**
McDaniel et al.(10) **Patent No.:** **US 6,977,235 B2**
(45) **Date of Patent:** **Dec. 20, 2005**(54) **CATALYST SYSTEMS COMPRISING A
CALCINED CHROMIUM CATALYST AND A
NON-TRANSITION METAL
CYCLOPENTADIENYL COCATALYST**(75) **Inventors:** **Max P. McDaniel**, Bartlesville, OK
(US); **Elizabeth A. Benham**, Spring,
TX (US); **Steven J. Secora**,
Bartlesville, OK (US); **Michael D.**
Jensen, Bartlesville, OK (US); **Kathy**
S. Collins, Bartlesville, OK (US)(73) **Assignee:** **Chevron Phillips Chemical Company,**
LP, The Woodlands, TX (US)(*) **Notice:** Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.(21) **Appl. No.:** **10/829,550**(22) **Filed:** **Apr. 22, 2004**(65) **Prior Publication Data**

US 2005/0239638 A1 Oct. 27, 2005

(51) **Int. Cl.⁷** **B01J 31/00; B01J 37/00;**
C08F 37/00; C08F 4/02(52) **U.S. Cl.** **502/117; 502/102; 502/103;**
502/104; 502/150(58) **Field of Search** **502/117, 102, 103,**
502/104, 150(56) **References Cited****U.S. PATENT DOCUMENTS**

| | | | |
|---------------|---------|----------------|------------|
| 2,825,721 A | 3/1958 | Hogan et al. | 260/88.1 |
| 3,119,569 A | 1/1964 | Baricordi | 241/55 |
| 3,152,157 A * | 10/1964 | Shapiro et al. | 556/58 |
| 3,248,179 A | 4/1966 | Norwood | 23/285 |
| 3,622,521 A | 11/1971 | Hogan et al. | 252/430 |
| 3,625,864 A | 12/1971 | Horvath | 252/430 |
| 3,887,494 A | 6/1975 | Dietz | 252/452 |
| 3,900,457 A | 8/1975 | Witt | 260/94.9 |
| 3,947,433 A | 3/1976 | Witt | 260/88.2 R |

| | | | |
|-------------|---------|-----------------|---------|
| 4,015,059 A | 3/1977 | Karol | 526/130 |
| 4,053,436 A | 10/1977 | Hogan et al. | 252/452 |
| 4,081,407 A | 3/1978 | Short et al. | 252/458 |
| 4,151,122 A | 4/1979 | McDaniel et al. | 252/458 |
| 4,152,503 A | 5/1979 | Short et al. | 526/106 |
| 4,177,162 A | 12/1979 | McDaniel et al. | 252/439 |
| 4,182,815 A | 1/1980 | McDaniel et al. | 526/96 |
| 4,247,421 A | 1/1981 | McDaniel et al. | 252/458 |
| 4,248,735 A | 2/1981 | McDaniel et al. | 252/428 |
| 4,277,587 A | 7/1981 | McDaniel et al. | 526/106 |
| 4,294,724 A | 10/1981 | McDaniel | 252/451 |

(Continued)

FOREIGN PATENT DOCUMENTS

JP 50045078 A2 4/1975

OTHER PUBLICATIONSDokter, "Cp Cocatalysts for Chromium Catalysts,"
PI-210481 Search Report, Jul. 24, 2003, 35 pgs.

(Continued)

Primary Examiner—J. A. Lorengo*Assistant Examiner*—Jennine Brown(74) *Attorney, Agent, or Firm*—Conley Rose, P.C.; Rodney
B. Carroll; Cheryl L. Huseman(57) **ABSTRACT**

According to an embodiment, catalyst systems for polymerizing olefins include a catalyst comprising chromium and a cocatalyst comprising a substituted or unsubstituted non-transition metal cyclopentadienyl compound (Cp). The catalyst also comprises an inorganic oxide support. In an embodiment, methods of preparing a catalyst comprise contacting a support with chromium and with a non-transition metal Cp compound. In one embodiment, the support may be contacted with a solution comprising the non-transition metal Cp compound prior to entry into a reaction zone. In another embodiment, the activated catalyst and non-transition metal Cp compound may be added separately to the reaction zone.

23 Claims, 3 Drawing Sheets